User Manual

deltaflowC – mass flow meter for Gases

1. Welcome to systec Controls

Thank you very much for using deltaflowC. deltaflowC is a state-of-the art mass flow meter for gases. This user manual guides you through the installation and parameterization step-by-step

2. Index

1. Welcome to systec Controls 2
2. Index 2
3. Scope of Supply / Unpacking 3
4. CE / Electromagnetic compatibility 3
5. Mounting 4
6. Recommended mounting position 7
7. Wiring 8
8. Parameterization 9
8.1. deltaflowC Designer Software 9
8.2. Parameterization step-by-step 9
8.3. Choose measurement span, outputs and damping 13
9. Span / Accuracy 18
10. Specification 21
11. Calibration 22
12. Type Code 22
13. Maintenance 23
14. Further information 23
15. Any questions? 23
16. Annex 24

Table 1 Measurement accuracies 20
Table 2 Specification 21
Table 3 deltaflowC Type code 22
Table 4 Densities of various gases at standard conditions 24

Picture 1 Dimensions 4
Picture 2 Example, deltaflow for bigger pipes 5
Picture 3 Example, deltaflow for smaller pipes, profile touches opposite pipe wall 5
Picture 4 Straight run requirements 7
Picture 5 cable room 8
Picture 6 Selection of type of probe 9
Picture 7 Select Media 10
Picture 8 Selection of customized gases 11
Picture 9 Eingabe Prozessparameter 12
Picture 10 Choose your span 13
Picture 11 Select signal damping 14
Picture 12 Select Outputs 15
Picture 13 DIP-Switches 16
Picture 14 Example of printout of parameter settings 17
Picture 15 Estimation of span 18
Picture 16 Example: Selection of end of span for pipe ID=200mm 19

3. Scope of Supply / Unpacking

Please unpack carefully. The deltaflowC comes together with a separated weld-in cutting ring stud. Please check all components for damages and report any damages to the forwarder within 24 hours. Please compare the content of the package to your order confirmation and the delivery note. Please also compare the model code to the model code stated in the order confirmation and/or the delivery note. Please report any deviations to systec Controls.

4. CE / Electromagnetic compatibility

deltaflowC was tested and is in agreement with the following standards

2006/95/EG Low Voltage Directive
2004/108/EG Electromagnetic Compatibility Directive

EN 61000-6-3: 2007-09
EN 61000-6-4: 2007-09 I

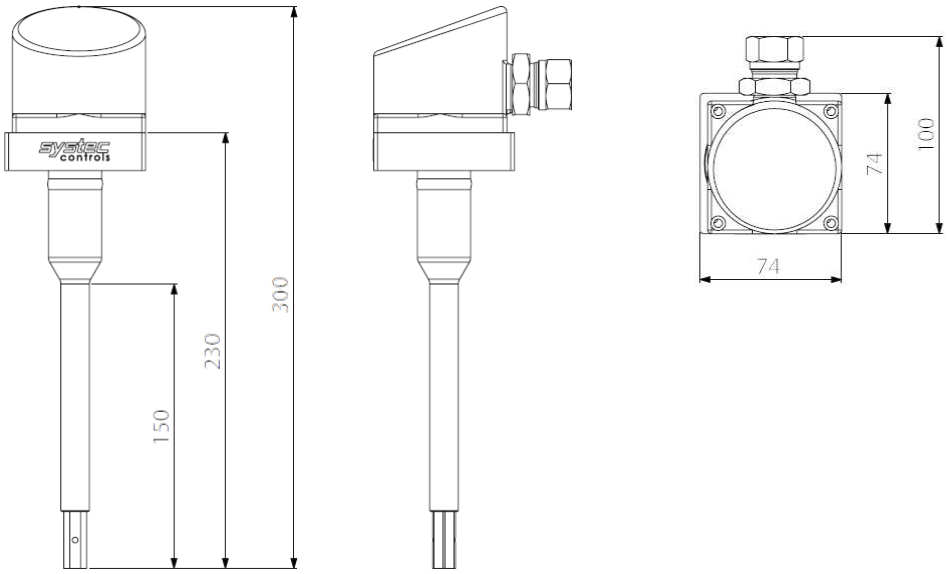
DIN EN 55022: 2008-05
EN 55011/ - 2010-05
EN 55014-1: 2010-0

EN 61000-6-1: 2007-10
EN 61000-6-2: 2006-03

EN 55014-2: 2009-06
EN 55024: 2003-10

EN 61000-4-2:2009
EN 61000-4-3: 2008-06
EN 61000-4-4: 2010-11
EN 61000-4-5:95+A1:01
EN 61000-4-6_2009-12

5. Mounting



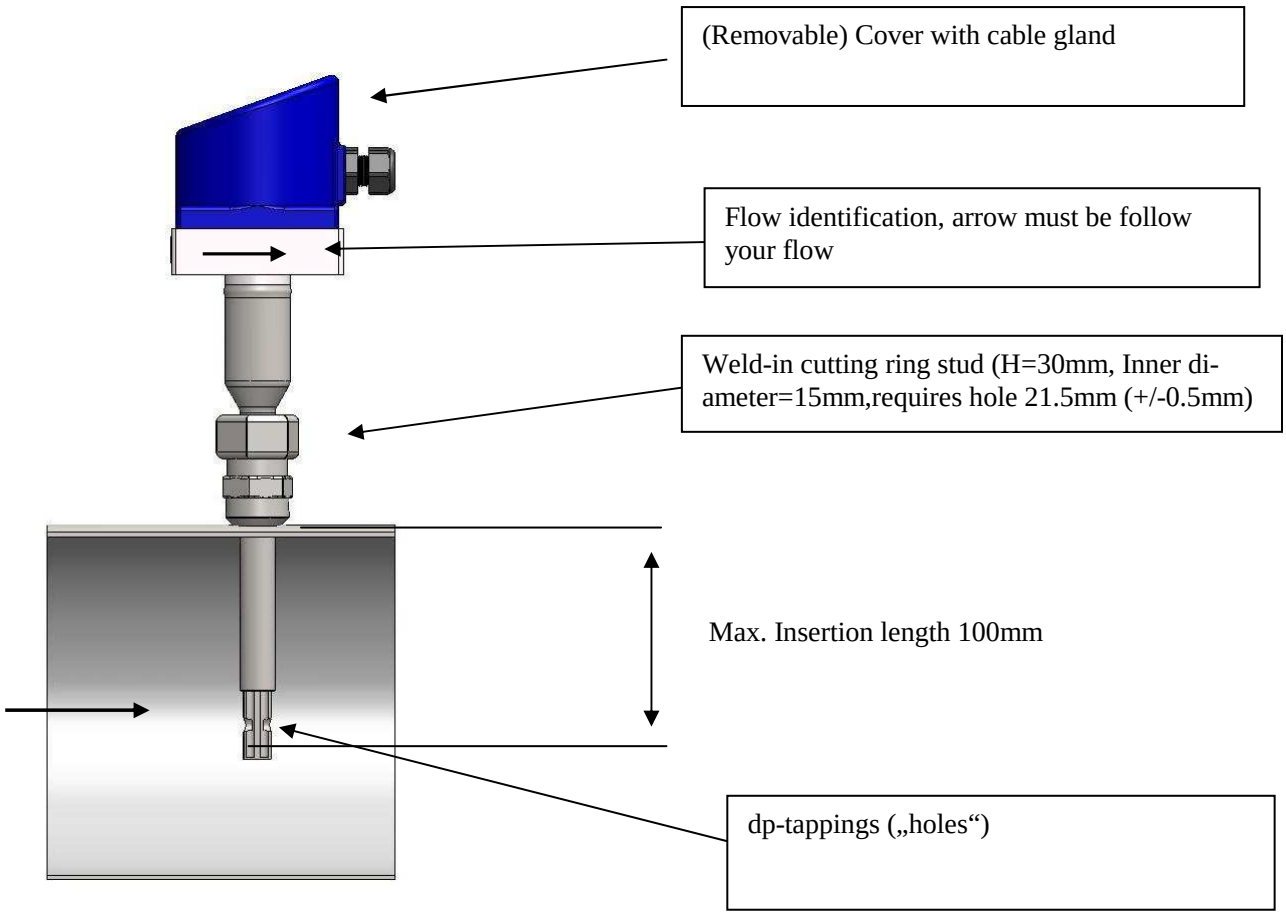
Picture 1 Dimensions

deltaflowC is feed into your pipe via a weld-in cutting ring stud (Picture 2). Please use the cutting ring stud from systec Controls.

The deltaflowC is feed into the pipe either until it hits the other side of the pipe (see Picture 3) or until the probe's neck reaches and is blocked by the cutting ring stud (see Picture 2). This means that the position of the dp tappings within the pipe depends on the pipe size. This is automatically considered by the design software when doing the parameterization.

On the deltaflowC lable ou will find a printed arrow indicating the correct mounting position. Please mount the deltaflow in that way that the arrow corresponds to the actual flow direction of your media (Picture 2)

The cover can be rotated if necessary.


(Removable) Cover with cable gland
Flow identification, arrow must be follow your flow
Weld-in cutting ring stud (H=30mm, Inner diameter=15mm,requires hole 21.5mm (+/-0.5mm)
Max. Insertion length 100mm
dp-tappings („holes“)

Picture 2 Example, deltaflow for bigger pipes

Picture 3 Example, deltaflow for smaller pipes, profile touches opposite pipe wall

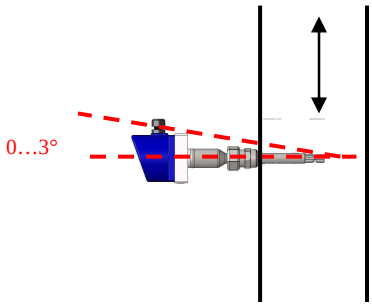
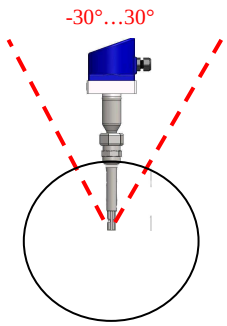
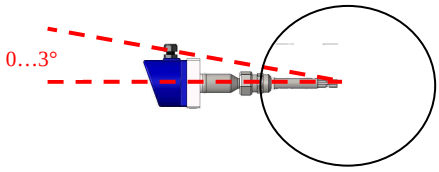
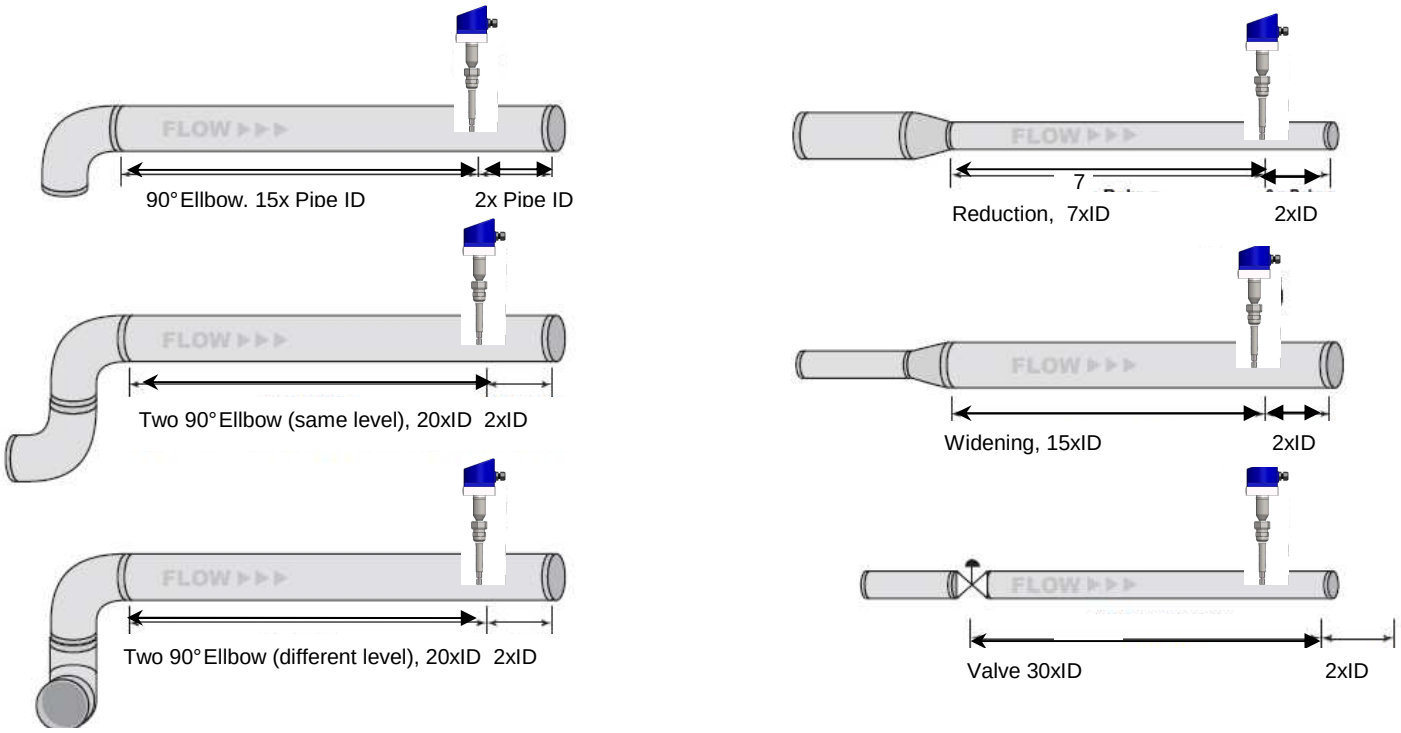
Pipe	Illustration	Designation
Vertical		The probe is installed in a horizontal position or with a slight incline (0..3°) toward the probe's tip. This ensures a free drain back of any condensate.
Horizontal, recommended mounting		The probe is installed vertically from top or at an angle between -30°…30°. This ensures a free drain back of any condensate.
Horizontal, alternative mounting		The probe is installed in a horizontal position or with a slight incline (0..3°) toward the probe's tip. This ensures a free drain back of any condensate.

Tabelle 1 Mounting positions

6. Recommended mounting position

To achieve the best possible accuracy the recommended straight runs (ID=internal diameter) given by Picture 4 should be fulfilled. Choosing the wrong position of mounting might result in poor measurement results. If you should feel not comfortable with your available straight runs we are happy to find the best position for your deltaflowC.



Picture 4 Straight run requirements

Recommended Filler Materials

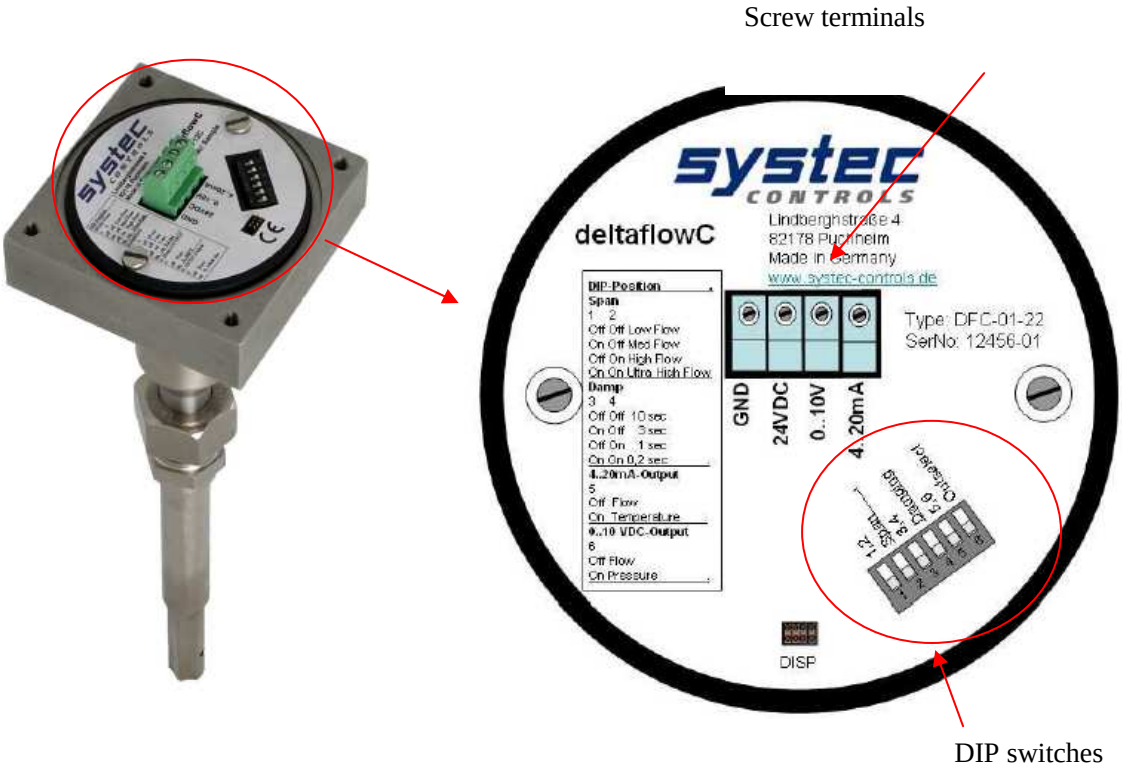
The material of cutting ring stud can be verified at order confirmation.

Material of Pipe	**Material of stud**	**WIG**	**Electrodes**	**Oxyacetylene**
Carbon steel (St. 35.8)	Carbon steel (St. 35.8)	DMO-IG	FoxEV50	BW XII
Carbon steel (St. 35.8)	Stainless steel (1.4571)	A7-A-IG	FoxA7-A-IG	
Stainless steel (1.4571)	Stainless steel (1.4571)	SAS4-IG	FoxSAS4-IG	

Tabelle 2 Filler Material

7. Wiring

For wiring please remove cover (see Picture 2) to access the cable room. Inside of cable room you have screw terminals and DIP switches for set-up and connection of power supply and outptus (see **Picture 5**



Picture 5 cable room

The 6 DIP switches can be used to set-up span, damping and outputs. The parameterization is done using the designer software (see chapter 8) and gives then the setting of the DIP swiches for your application.

For power supply please use 18-36 VDC.

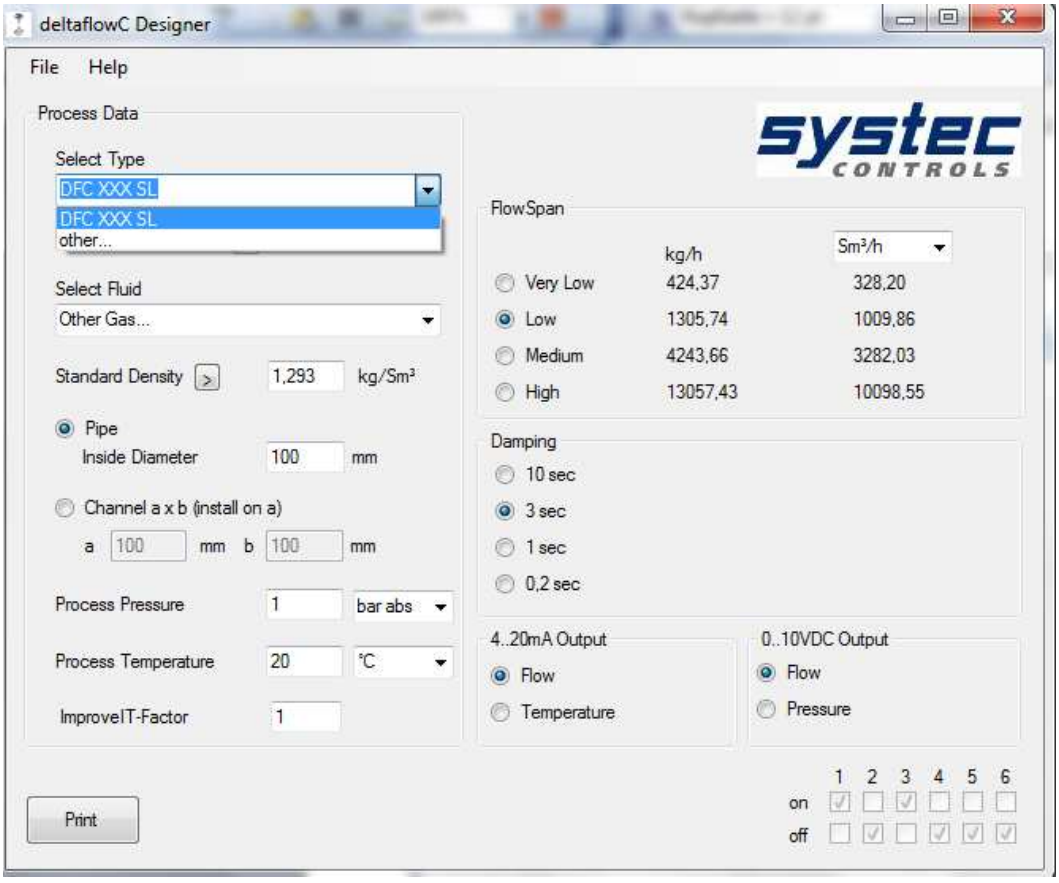
8. Parameterization

8.1. deltaflowC Designer Software

The parameterization is simple and fast and is done by using the deltaflowC designer software. You can download the designer software free of charge from our webpage.

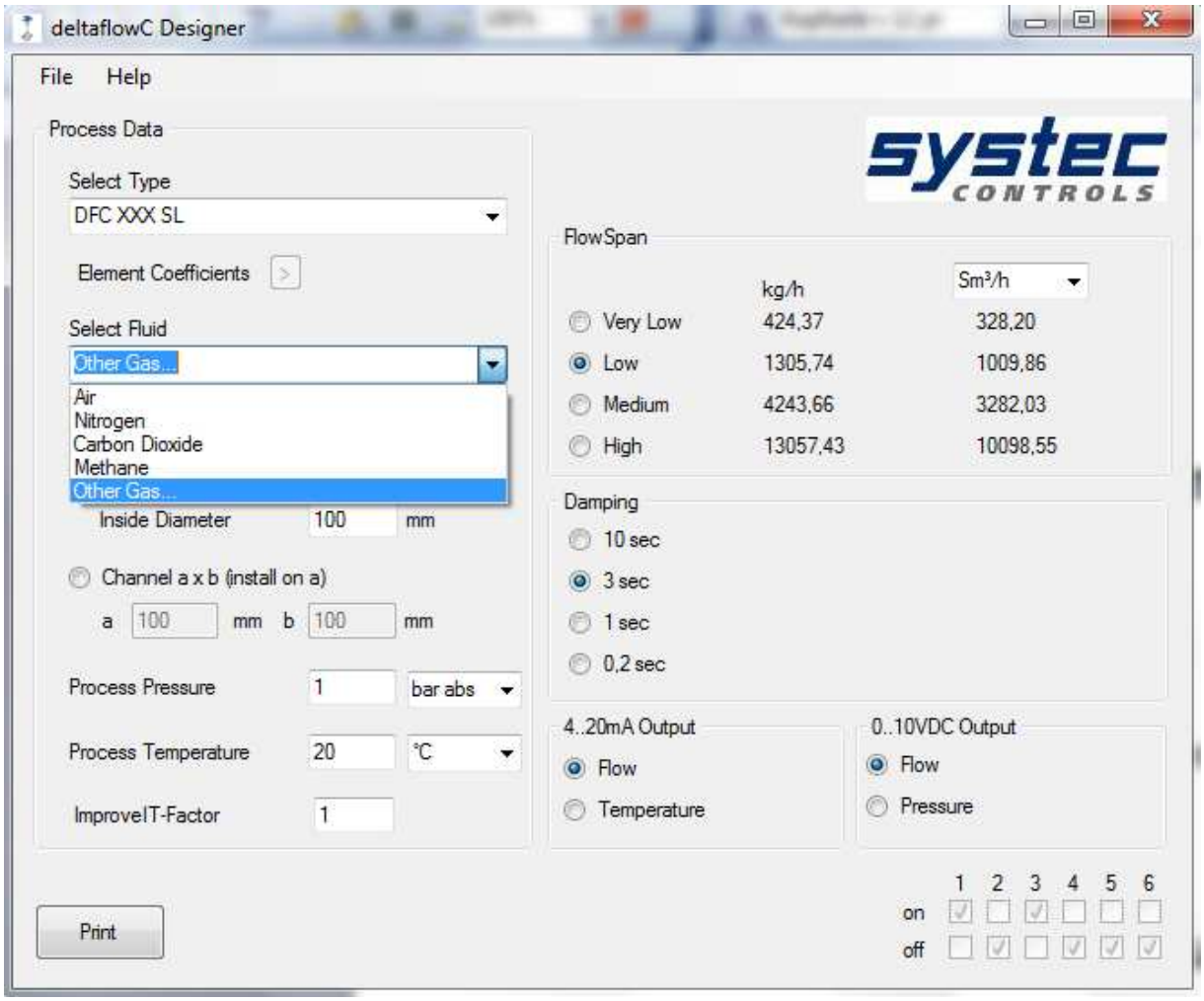
With the designer software you can set your process parameters and outputs and you can choose flow range and signal damping.

8.2. Parameterization step-by-step



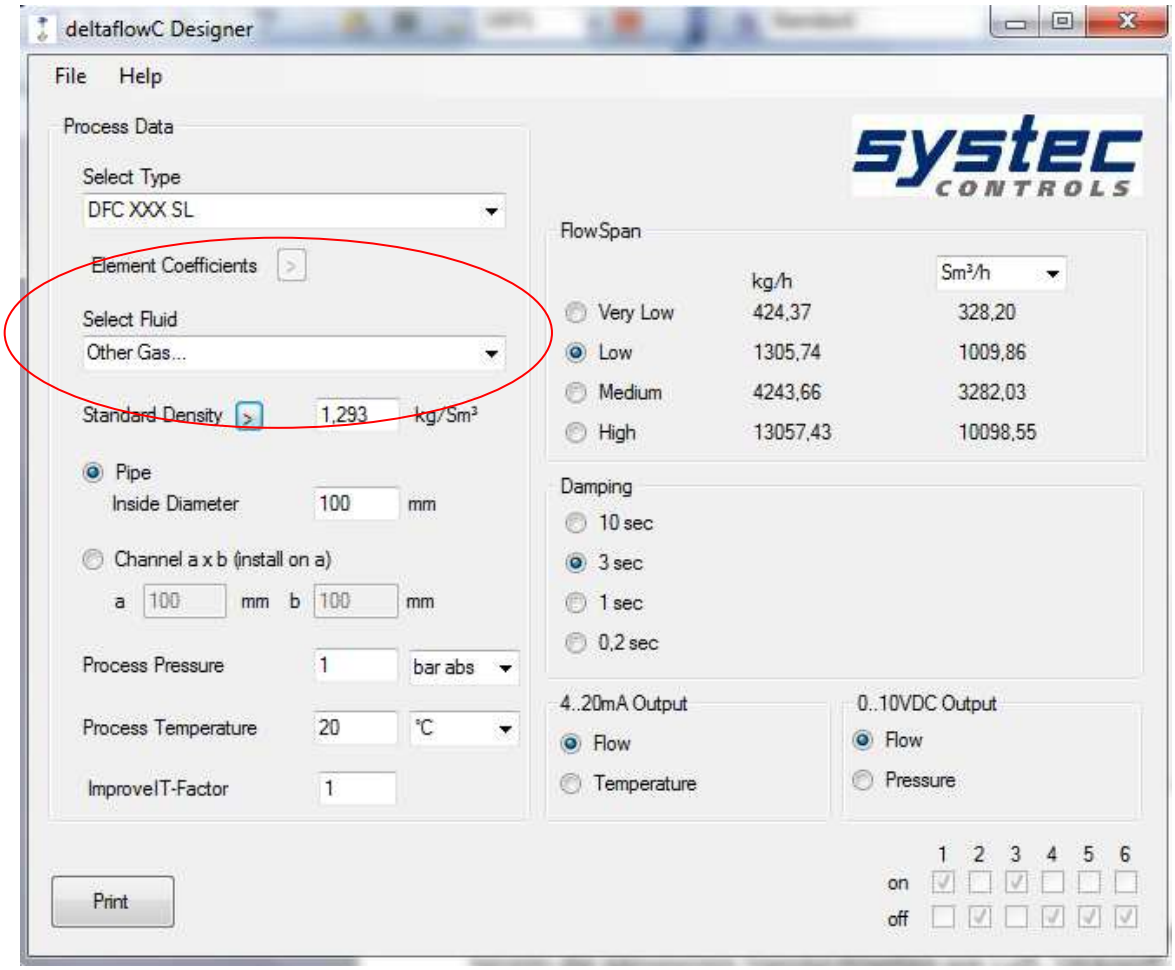
Picture 6 Selection of type of probe

Please select type DFC….. at the „Select Type“ box (see **Picture 6Picture 6**)



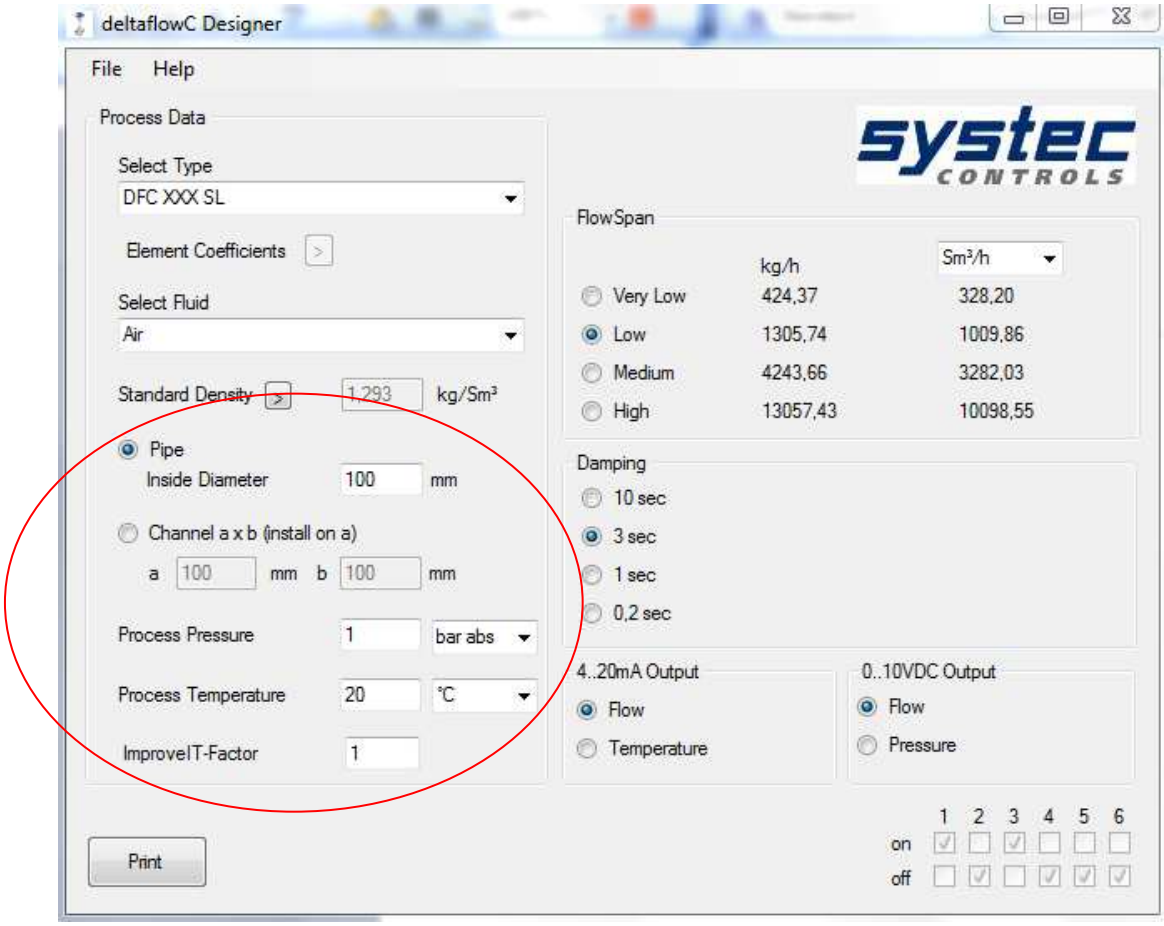
Picture 7 Select Media

Now please select your media. You already have the most common gases in the internal data base (see **Picture 7**) like air, nitrogen, carbon dioxide….



Picture 8 Selection of customized gases

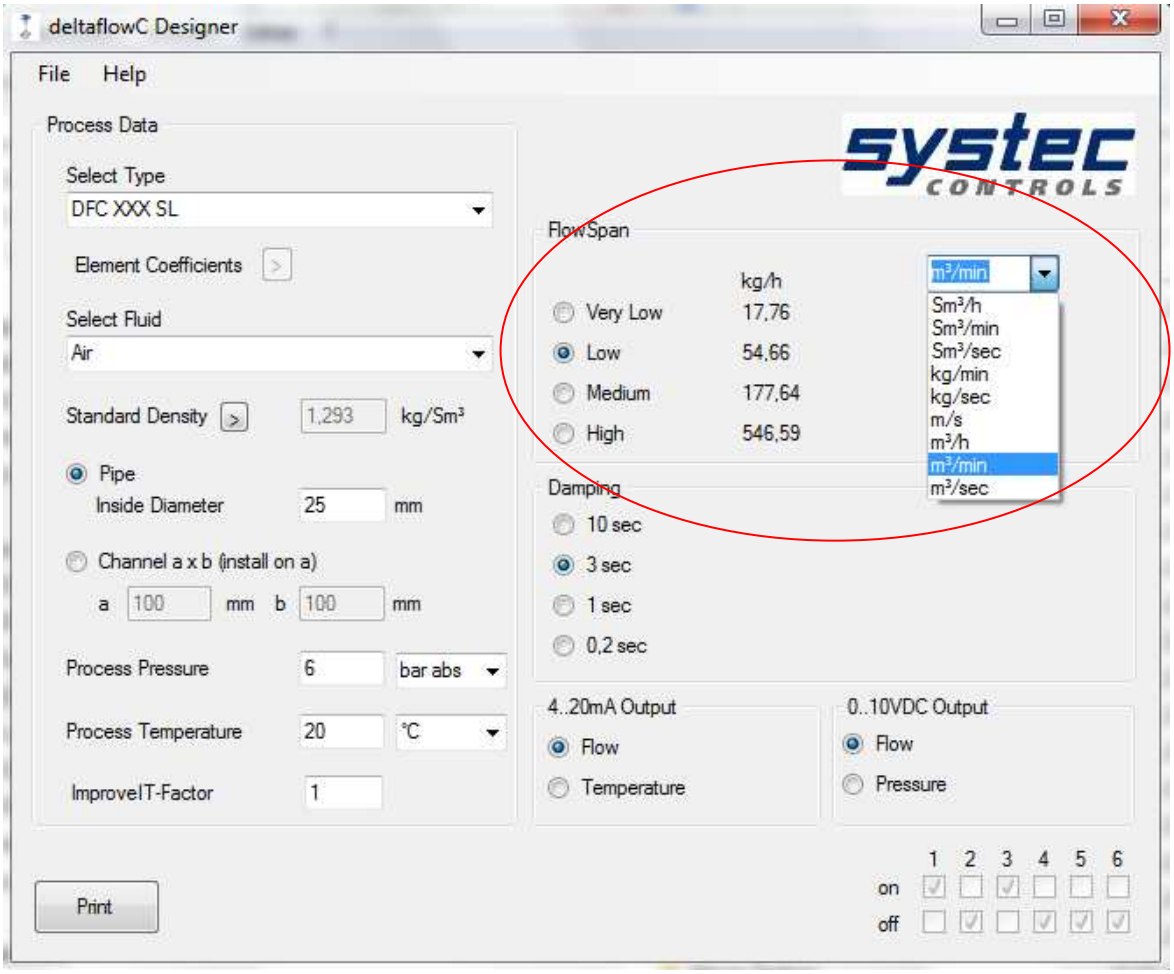
If your media should not be in the data base please choose „other gas“. Then you need to put in the density at standard conditions. Common densities can be found in the attachment. Normally standard conditions are related to 1013.25mbar and 0℃. If y ou have densities at different standard conditions you can change the standard conditions by clicking at the arrow next to “Standard Density”. You will find densities for common gases also in the Annex.



Picture 9 Specification of process parameters

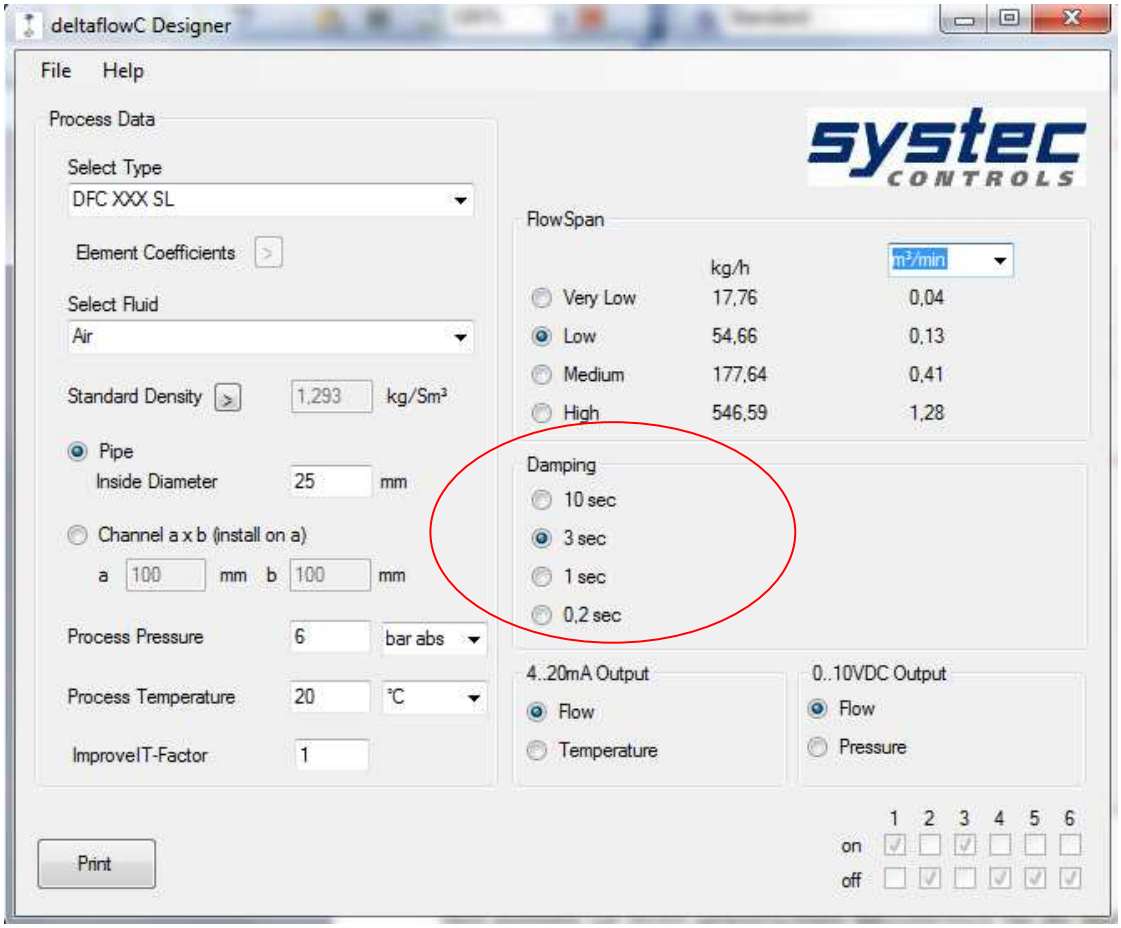
Now please enter pipe diameter (inner) or dimensions (inner) of your channel and design process data. You can choose different units for your process data.
The ImproveIT-Factor (default value = 1) normally does not have to be changed. The ImproveIT-factor can be used to improve accuracy in case of specific short straight runs (required straight runs see chapter 6). Please ask your systec dealer for a proper ImproveIt-factor.

8.3. Choose measurement span, outputs and damping



Picture 10 Choose your span

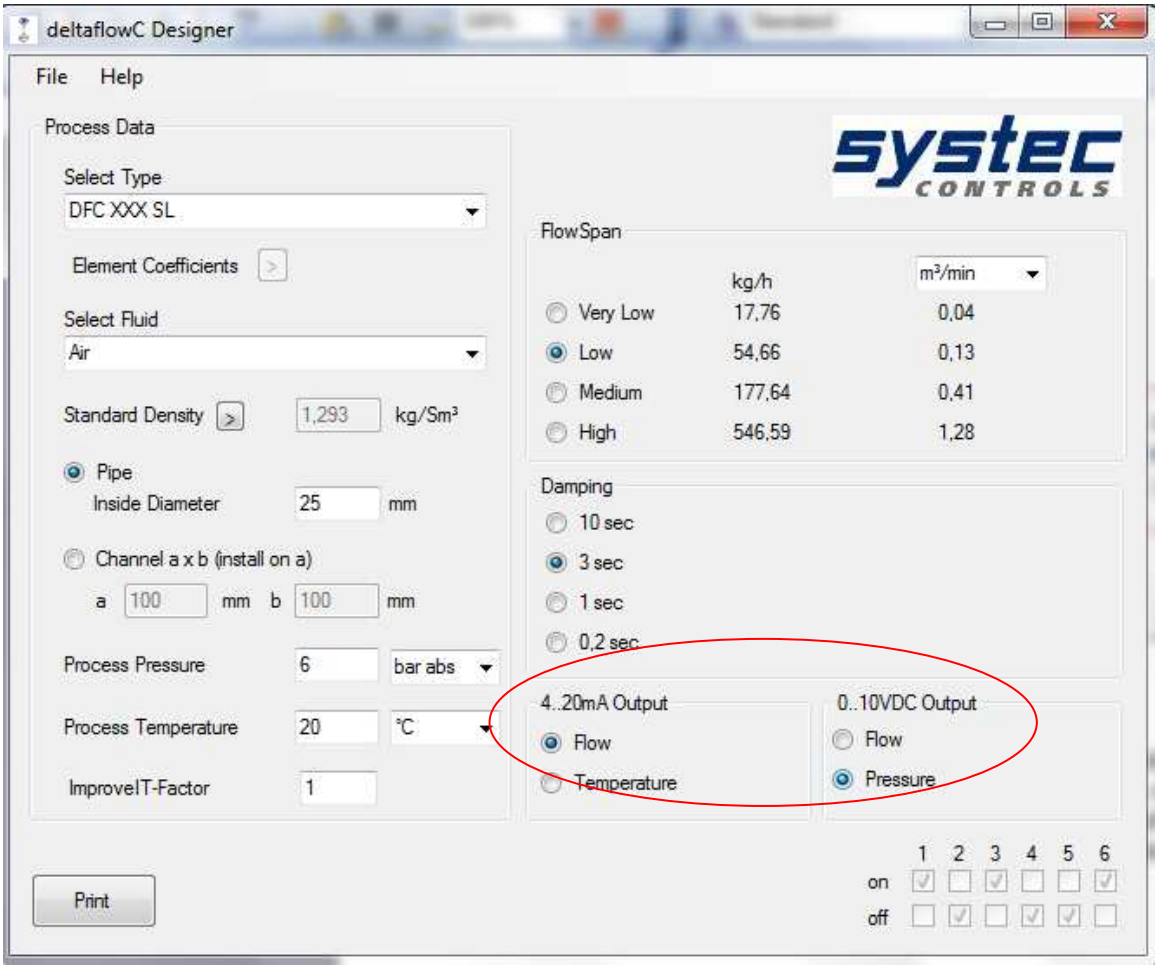
After setting your pipe and process data the designer software calculates the available spans for your mass flow signal. You can choose from up to 4 different spans. You can select different units. Please choose the proper span for your applications. The value given by the software (in **Picture 10** e.g. “low flow” = 54.66 kg/h) indicates the end of span and so the value which corresponds to 20mA or 10V (see **Picture 12** for setting outputs)



Picture 11 Select signal damping

Please select the signal damping as shown in **Picture 11**. You can choose from 4 different values between 0.2sec to 10sec. It is a T63-damping.

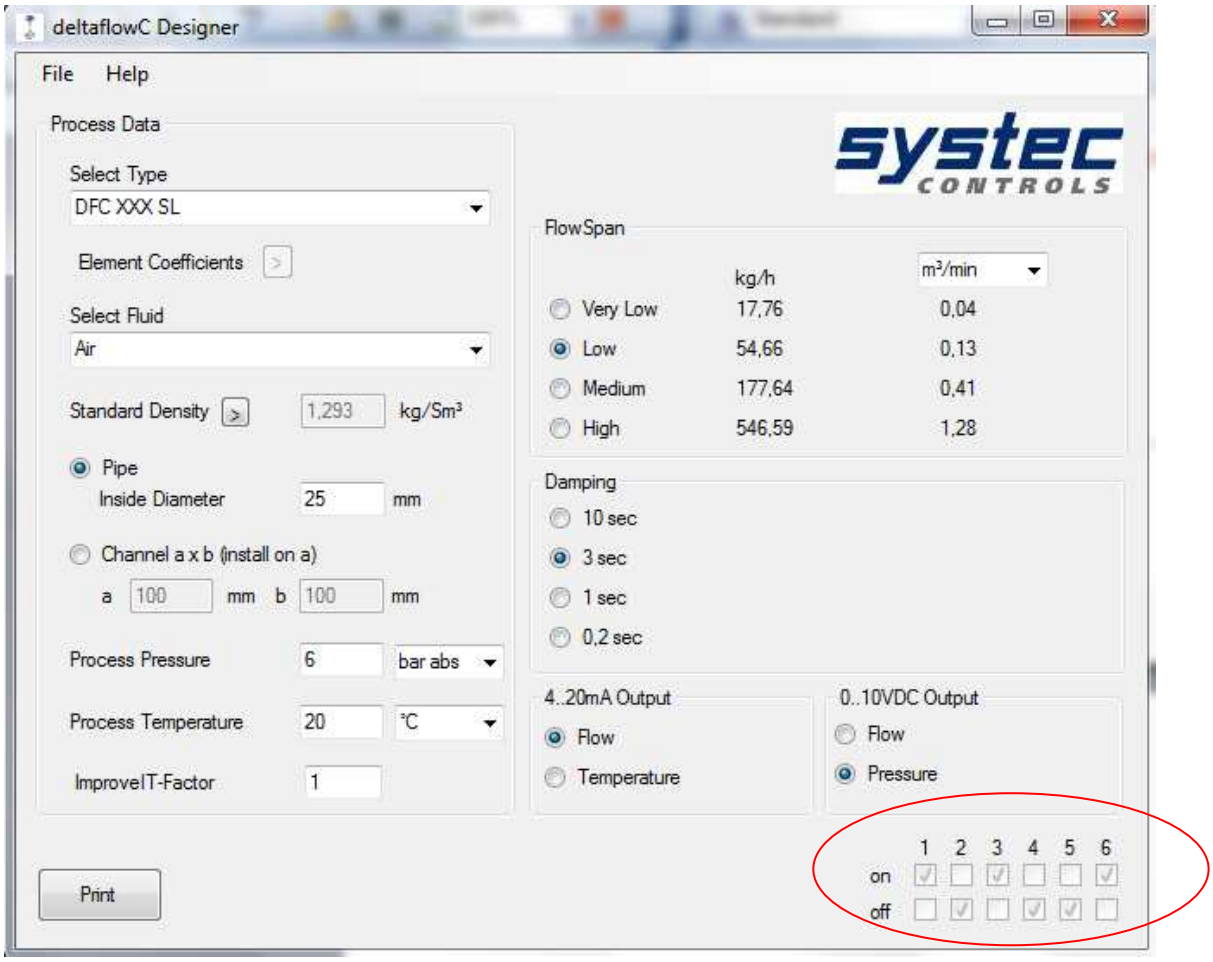
Example: Damping = 3 sec. If there is a change in flow the signal output will reach a level of 63% of the current flow after 3 seconds. 0.2sec is for (rare) applications which requires immediate response (“fast mode”). For standard applications 3 or 10 sec. had proved to be a proper damping.



Picture 12 Select Outputs

deltaflowC offers two signal outputs for mass flow and static pressure or temperature. For flow or temperature you can use the 4…20mA output (3-wires). For flow or pressure you can (additionally) use the 0…10VDC output. In the designer software you can allocate the outputs to the related measured variable. In the example shown in **Picture 12** you would use 4…20mA output for mass flow (4..20mA = 0..54.66 kg/h) and the 0..10VDC output for static pressure.

The span of mass flow corresponds to the span choosen before (see **Picture 10**). The span for temperature and static pressure is fixed to 4…20mA = -40…..500℃ respectively 0…10VDC = 0…14bar.



Picture 13 DIP-Switches

Now all necessary settings have been done. As the result from this the designer software gives you the setting of the DIP-switches. Please set the DIP-switches in the cable room (see **Picture 5**) of your delta-flow according to the settings given by the designer software

The designer software offers a „print“ function which allows you to print out your settings (example see **Picture 13**) for your documentation.

deltaflowC Designer Results

deltaflowC Type	DFC XXX SL	Discharge Coefficient	0,4075 -
Fluid	Air		
Standard Density kg/Sm³	1,293		
Standard Conditions	0 °C 101,325 kPa		
Pipe Inside Diameter	25 mm		
Process Pressure	6 bar abs	Process Density	7,134 kg/m³
Process Temperature	20 °C		
ImproveIT-factor	1		

Analogue Output 1: 4..20mA
Low Flow Range: 0..54,66 kg/h eaqual to 0..0,13 m³/min
Analogue Output 2: 0..10VDC
Pressure Range: 0..11bar abs eaqual to 0..159.5415 PSI
Analogue Output Damping: 3sec

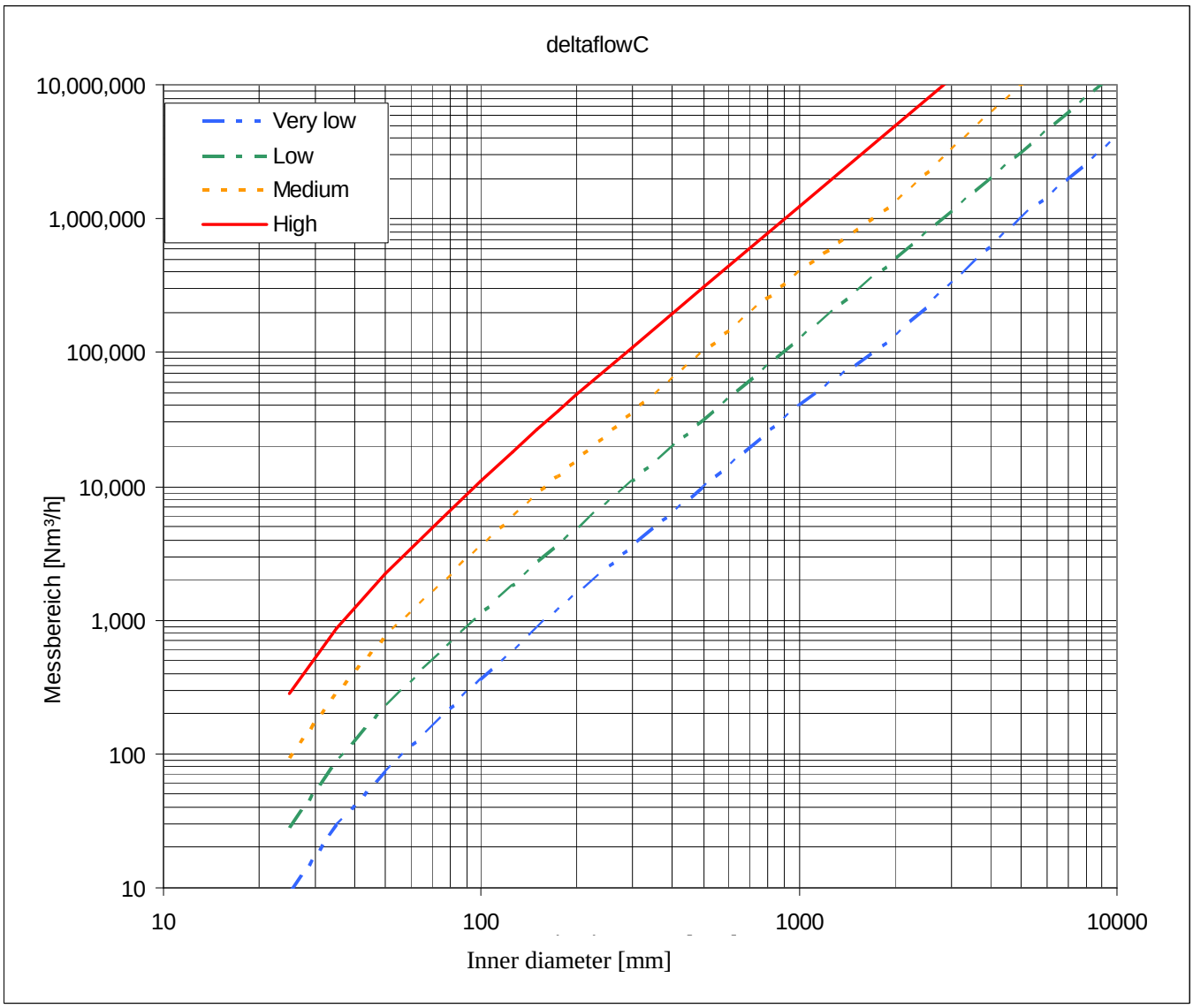
DIP-Switch Settings:
DIP-Switch 1: ON
DIP-Switch 2: OFF
DIP-Switch 3: ON
DIP-Switch 4: OFF
DIP-Switch 5: OFF
DIP-Switch 6: ON

systec Controls Mess- und Regltechnik GmbH, Lindberghstrasse 4, D-82178 Puchheim/Munich, Germany
www.systec-controls.de, info@systec-controls.de, Fon:+49-(0)89-80906-0
Version 1.00

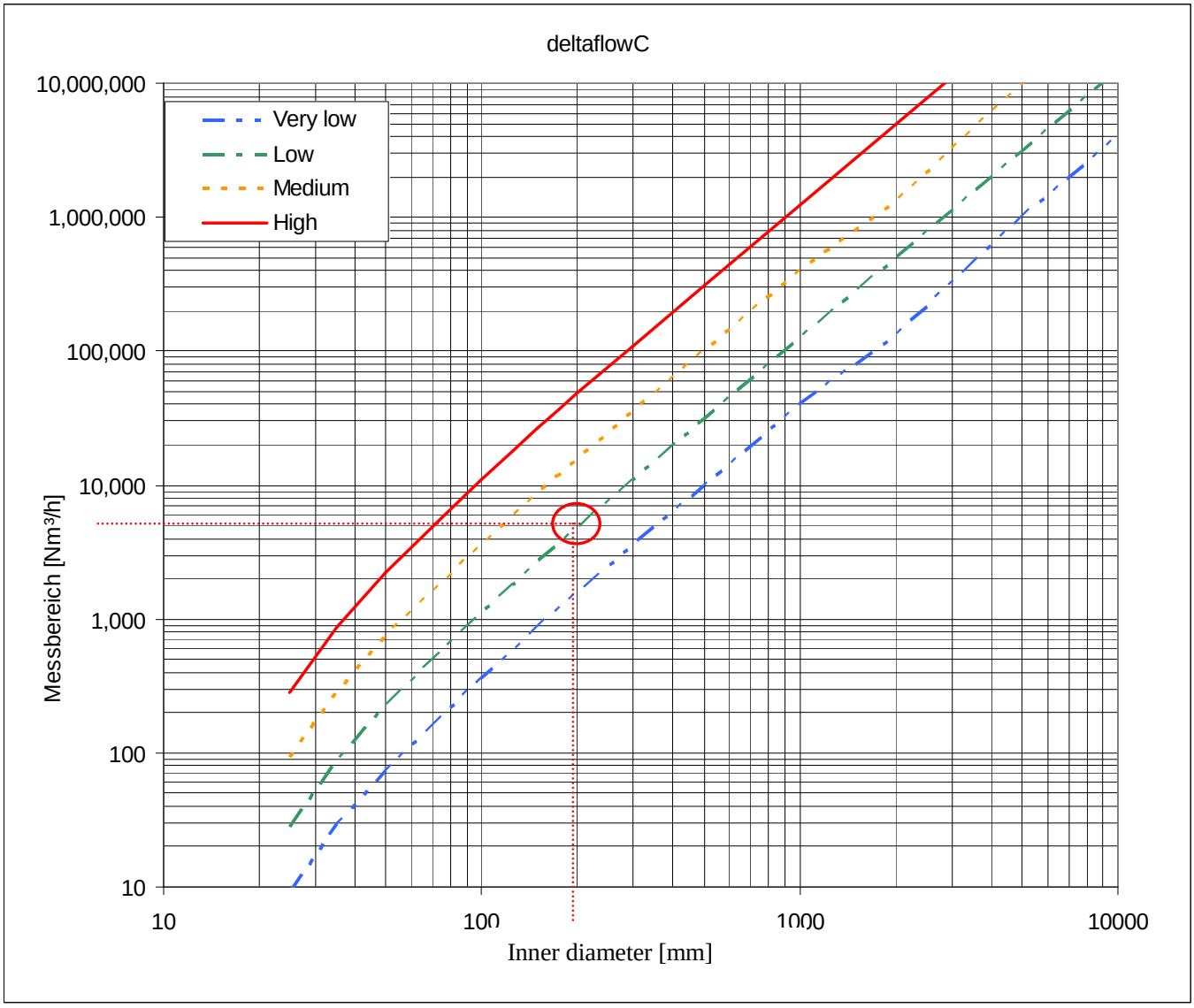
Picture 14 Example of printout of parameter settings

9. Span / Accuracy

deltaflowC offers you up to 4 different spans from „low flow“ to „high“. Using **Picture 15** you can estimate the upper range value (end of span) for your pipe size to check feasibility of applications.



Picture 15 Estimation of span



Picture 16 Example: Selection of end of span for pipe ID=200mm

The example from **Picture 16** should illustrate this. Selecting a pipe diameter of 200mm would end up in a span of app. 5000 Nm3/h (green curve = “low”). For this pipe you could also choose between other spans from “very low” (blue curve = app. 1400 Nm3/h) to “medium” (orange curve) = app. 15000Nm3/h) and “high” (red curve = app. 50,000 Nm3/h). The graph shown in **Picture 16** is mainly to check feasibility of deltaflowC for your application but also to check accuracies (next chapter)

Two different accuracy classes are available as shown in Table 1.

Typ	Accuracy	Designation
Standard (Code …..DS…..see Table 3)	4% of reading	Starting from 10% of low-flow span
High-Accuracy (Code ……DH…see Table 3)	2% of reading	2% Starting from 15% of low-flow span respectively 4% starting from 7% of low-flow-span

Table 1 Measurement accuracies

The accuracy statement always corresponds to the “low”- curve (green curve) which you can pick out from diagram shown in **Picture 15**

Example: In the example shown in **Picture 16** you have an end of span of 5000 Nm3/h. The standard type reaches an accuracy of 4% starting from 10% of the choosen span (here 500 Nm3/h). The high accuracy type reaches an accuracy of 4% starting from 7% of choosen span (here 350Nm3/h) and an accuracy of 2% starting from 15% of span (here 750 Nm3/h).

10. Specification

Metering	
Principle	Differential pressure with pressure and temperature compensation
Measured quantities	Mass flow, temperature, static pressre
Span	1:25
Accuracy	Standard type: Starting from 10% of low-flow span High-accuracy: 2% Starting from 15% of low-flow span respectively 4% starting from 7% of low-flow-span
Operating conditions	
Media	Gases, non-explosive / non-corrosive
Pressure	10 bar
Temperature of Media	-80…250℃
Ambient temperature	-40…120℃
Material	SS316Ti
Material enclosure	SS316Ti, painted
Burst Pressure	16 bar
Probe length	Max. insertion length 100mm
Pipe sizes	Starting from DN20 (2/3“)
Electrical connector	4 terminal screws
Power supply	18 – 36 VDC
Outputs	1x 4…20mA (3-wire) 1x 0…10VDC
Degree of Protection	IP67

Table 2 Specification

11. Calibration

The high-accuracy type always includes a calibration which is done at our traceable test rig (air).

12. Type Code

The type code is printed on the lable of your deltaflowC. Using the type code shown in Table 3 you can easily reorder the proper model or choose the right model for other applications.

Please also use your online formular to place your inquiries or orders or call us at

+49 89 80 90 6 0

http://www.systec-controls.de/253-1-deltaflowc---mass-flow-meter-for-gases.html
Thank you

	Basic Type	Process connection	Accuracy	options	notes
DFC					deltaflowC Massflow Sensor
	P10				Probe 100mm insertion depth
	V32				CompactVenturi DN32PN16
	V50				CompactVenturi DN50PN16
	V80				CompactVenturi DN80PN16
		PWS			weld in cutring SS316 (only Basic Type P10)
		PWC			weld in cutring CS (only Basic Type P10)
		PF			Interflange Connection PN16, RF
			DS		Standard type
			DH		High Accuracy Type (OC required)
				O-	none
				OC	calibration protokoll (3 points)

Table 3 deltaflowC Type code

13. Maintenance

deltaflowC offers long-term stability and does normally not require maintenance.

14. Further information

These documents can be downloaded from our webpage or can be obtained from our sales agents.

- deltaflowC Brochure
- deltaflowC parameterization software (Designer)

http://www.systec-controls.de

15. Any questions?

We are happy to support you. Please do not hesitate to use the expertise and application know-how of your sales engineers and sales agents.

You can check our web page to find your local systec agent.

http://www.systec-controls.de/5-1-contact-und-information.html

Of course we are always happy to take your calls in our headquarter in Puchheim, Germany.

systec Controls Hotline:

+49-(0)89 - 80 90 6 - 108

16. Annex

Densities of different gases at standard conditions (0℃, 1013.25 mbar) in kg/m3)

Ammoniak	0,7714
Argon	1,784
Butan	2,703
Chlor	3,214
Chlorwasserstoff	1,6392
Dimethylether	2,1098
Helium	0,1785
Kohlendioxid	1,9769
Kohlenmonoxid	1,250
Krypton	3,744
Luft	1,2929
Methan	0,7168
Neon	0,9002
Propan	2,0096
Sauerstoff	1,42895
Stadtgas	ca. 0,6
Stickstoff	1,2505
Wasserdampf	0,768
Wasserstoff	0,08988
Xenon	5,897

Table 4 Densities of various gases at standard conditions